

# Surface Modification of Exfoliated Graphite Nano-Reinforcements, Phase I

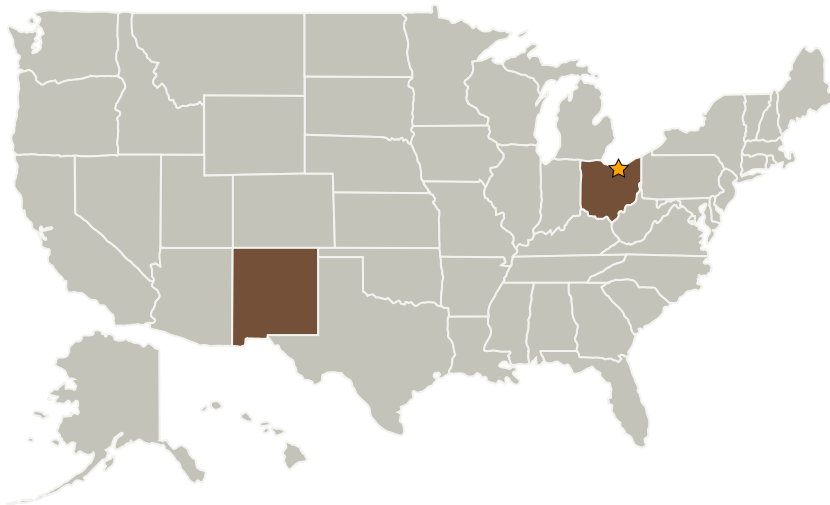
Completed Technology Project (2005 - 2005)



## Project Introduction

Nano forms of graphite and carbon, such as flakes, worms, and tubes, can significantly modify the properties of polymers when used as reinforcements. Challenges remain in processing composites with these nano-reinforcements in the form of attaining uniform dispersions. Many of these difficulties are due to a lack of wetting of the nano-reinforcements by the polymer. Poor wetting is caused by the very low surface energy of the as-produced graphite nano-reinforcements. Opportunities exist for modifying the surface chemistry and energy of nano-reinforcements that will allow improved wetting and provide a means for chemical bonding at the interface with high temperature polymers such as PMR-II-50 polyimide. Two approaches for surface modification are proposed: (1) oxidative plasma treatments to populate the graphite surface with carboxyl and hydroxyl groups, and (2) bonding of polyimide oligomers to the nano-reinforcements using reactive coupling agents. Both of these approaches have proven successful with micron size carbon and graphite fibers and with nanofibers. As such, these treatments should result in nano-reinforced composites with superior mechanical properties and environmental durability.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Glenn Research Center (GRC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Adherent Technologies, Inc.	Supporting Organization	Industry	Albuquerque, New Mexico

## Primary U.S. Work Locations

New Mexico	Ohio
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Ronald E Allred

## Technology Areas

**Primary:**

- TX03 Aerospace Power and Energy Storage
  - └ TX03.1 Power Generation and Energy Conversion
    - └ TX03.1.3 Static Energy Conversion